Fault-Protected Laser Diode Drivers for Improving the Performance and Lifetime of Multiple-Millisecond, Long-Pulse LDAs for NASA LIDAR Systems, Phase II

Completed Technology Project (2006 - 2008)

Project Introduction

This SBIR project will develop and deliver to NASA revolutionary laser diode driver technology with intelligent fault protection for driving high power laser diode arrays (LDAs). A key goal of the project is to increase the lifetime of LDAs operating under long-pulse (>2 msec), quasi-CW conditions by a factor-of-10, to at least 1 billion shot lifetime, in order to meet NASA mission requirements. A critical issue with operating LDAs for long pulses is localized diode heating leads to current and optical instabilities, which damages emitters resulting in LDA failure. SRL has demonstrated that diode instabilities can be detected and eliminated, and SRL's fault protected drivers increase laser diode lifetimes by more than a factor-of-10. A key technical step that will be implemented in Phase 2 is to develop and integrate SRL fault protection with laser diode stacks. This will also include NASA-developed temperature/voltage diagnostic to provide additional information on laser diode performance and lifetime. In Phase 2 SRL will develop multiple laser diode protection technologies, and deliver to NASA an integrated fault protection module for test and evaluation. This fault protected driver package for laser diode stacks will support scale up designs for flight hardware in Phase 3.

Anticipated Benefits

Potential NASA Commercial Applications: Initially the customers for the government market will be system providers for NASA and the DoD. From SRL's discussions with General Atomics, BAE, Boeing and Northrop Grumman, we estimate the market size will be small initially as these organizations are in the process of delivering pre-prototypes and prototypes. The BAE Systems market is more established and, starting in 2009, they plan to deliver approximately 100 laser systems annually that can integrate SRL's fault protected technology. SRL expects to sell drivers for $10,000 per unit that gives a total market of approximately a million dollars annually. This market is expected to increase by 20% annually as SRL's power supplies are integrated into additional systems and General Atomics and Northrop Grumman prototypes become NASA and DoD hardware. The private sector market is $3.2 billion annually and is interested in LDAs pumping solid-state lasers for industrial welding and cutting, and advanced lithography EUV sources.

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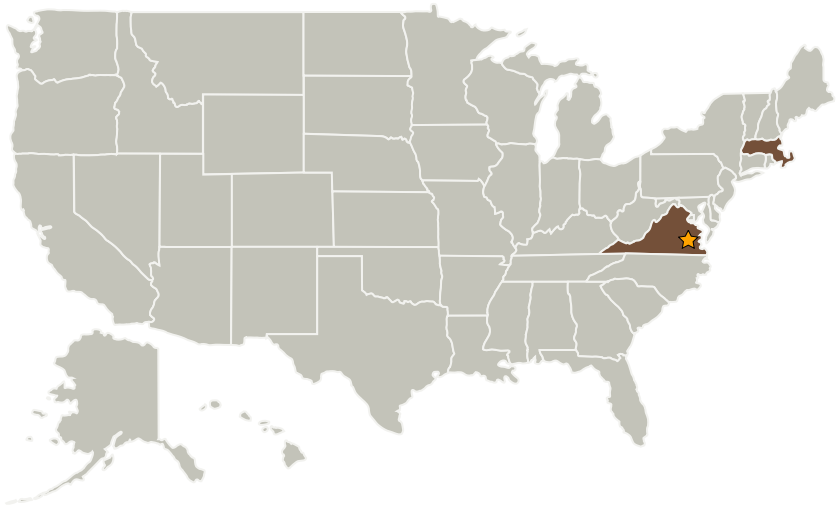
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Science Research Laboratory, Inc.	Supporting Organization	Industry	Somerville, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

December 2006: Project Start

November 2008: Closed out

Closeout Summary: Fault-Protected Laser Diode Drivers for Improving the Perf ormance and Lifetime of Multiple-Millisecond, Long-Pulse LDAs for NASA LIDAR Systems, Phase II Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Rodney Petr

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.4 Operational Assurance